



CASE REPORTS

Diagnosis of Acute Abdominal Disease In Paraplegic Patients

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ACUTE ABDOMINAL EMERGENCIES are rarely reported in patients with paraplegia,* despite the fact that there were more than 100,000 paraplegic patients in the United States by 1953,⁶ including nearly 6,000 of them in armed services hospitals.⁸ The following report is of two paraplegic patients, one of whom had pneumoperitoneum and the other probable pelvic inflammatory disease.

Reports of Cases

CASE 1. An obese 41-year-old paraplegic man was admitted to Franklin Hospital on November 7, 1963, because of a wrist infection and malfunction of a suprapubic cystostomy tube. Complete motor sensory loss below the seventh thoracic root resulted from transverse myelitis after spinal anesthesia in 1946. The suprapubic cystostomy tube,

inserted in 1960 because of penile and scrotal edema, had a well-fibrosed tract around it and could be replaced easily. Previous history included a duodenal ulcer, appendectomy, frequent urinary tract infections and calculi.

Physical examination showed inflammation at the operative site of a recent ulnar neurolysis but there were no abnormal abdominal findings. The patient had massive penile and scrotal edema, and the suprapubic cystostomy tube was not draining. The tube was removed and a catheter was inserted with a stylet. Drainage then was good. Two hours later the patient began to have chills and the temperature rose to 100°F. He vomited bile-colored material and complained of pain in the right shoulder. Antacids gave no relief. The only significant abdominal finding was absence of liver dullness. The hematocrit was 40 per cent and the leukocyte count was 15,400 per cu mm with a leftward shift of the differential. Urinalysis showed moderate proteinuria and a sediment of 400 leukocytes and 200 erythrocytes per high power field. The blood urea nitrogen was 32 mg per 100 ml. Vomited material was positive for occult blood. Roentgenologic studies showed pneumoperitoneum and dilated, fluid-filled loops of small bowel. The presumptive diagnosis was perforated duodenal ulcer.

Exploratory laparotomy showed that the cystostomy tube had perforated its sinus tract. Thick, cloudy uriniferous fluid was present within the peritoneal cavity, and the urinary bladder was extremely contracted. The sinus perforation was closed and a catheter was inserted into the bladder under direct vision. The postoperative course was complicated by hypotension, ileus, peritonitis and signs of acute renal tubular failure. The patient eventually responded to supportive care and antibiotics and was discharged from the hospital 21 days after operation.

CASE 2. An 18-year-old paraplegic woman was admitted to Franklin Hospital for surgical man-

*Reference Nos. 2, 8, 10, 13 to 15, 16, 21.

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agement of decubitus ulcers. She had become paraplegic after a bullet had lodged in her spinal cord at the level of the 12th thoracic root. Previous history included laminectomy, appendectomy and ureteroileostomy. After admission to the hospital she had acute onset of cramps, abdominal pain, nausea and vomiting. The pain was at first diffuse but later localized to the left lower quadrant of the abdomen. The blood pressure was 140/90 mm of mercury, the pulse rate 120 and the temperature 103°F. Guarding and tenderness were noted in the left lower quadrant of the abdomen but there was no rebound tenderness. Pelvic examination showed a milky vaginal exudate, and pronounced tenderness was noted during cervical manipulation. A tender small mass was felt in the left adnexal area. Motor and sensory function were absent below the level of the 12th thoracic root.

The hematocrit was 39 per cent and the leukocyte count was 14,050 per cu mm with a leftward differential shift. Urinalysis showed five white cells per high power field and a 2-plus reaction for protein. Abdominal roentgenograms showed a patchy gas pattern in the small bowel and poor visualization of renal and psoas shadows. An intravenous pyelogram and retrograde pyelographic examination showed normal kidneys and a functioning ureteroileostomy. A large adnexal mass was found during pelvic examination at the time of cystostomy.

The patient was treated with nasogastric suction, intravenous fluids and antibiotics and became afebrile with symptomatic improvement by the fourth day. She remained afebrile although continuing to have mild lower abdominal pain. On the 13th day severe pain with rebound tenderness in the left lower quadrant of the abdomen developed, but without fever. A barium enema showed no intrinsic bowel disease. Surgical intervention was strongly considered but was withheld in favor of conservative therapy since recurrent salpingitis seemed the most likely diagnosis. She became asymptomatic after supportive therapy and the consensus of the staff was that she had had acute pelvic inflammatory disease.

Discussion

Pneumoperitoneum with peritonitis caused by a suprapubic cystostomy tube has not to our knowledge been previously reported.^{14,28,20} Spensley and his coworkers²⁰ did not mention such a case in

their review of unusual causes of pneumoperitoneum and acute abdomen, nor could we find a similar case since Popper¹⁸ first utilized pneumoperitoneum as a sign of perforation of the gastrointestinal tract.

Acute abdominal disease is rarely mentioned in the mortality and morbidity figures of large series of paraplegic patients. The mortality rate from all causes was 15 per cent in 134 paraplegic patients who were observed over a five-year period.¹³ The cause of death in 21 of these patients included renal failure (eight patients), coronary occlusion (two patients), cerebrovascular accident (two patients), death from violence (four patients), pulmonary embolus (two patients), pneumonia (one patient) and infectious hepatitis (one patient). The cause of death was unknown in seven patients. Monro¹⁶ analyzed 212 cases of paraplegia but mentioned no cases of acute abdominal emergency. The major complications in that series included sacral decubiti, incontinence, calculi, infections, skeletal muscle spasms and contractures. Botterell² reported seven deaths in 103 paraplegic patients. The causes of death included genitourinary sepsis (two patients), intraperitoneal rupture of a perinephric abscess (one patient), uremia (one patient), acute necrosis of the liver (one patient) and coronary thrombosis (one patient). The remaining death was due to an automobile accident.

In contrast to these clinical studies it is important to note the report of Dietrick and coworkers,⁶ who studied 55 paraplegic patients at autopsy. They found that six patients (11 per cent) had acute abdominal catastrophes. These included three patients with ruptured bladders, one with intestinal obstruction and a ruptured cecum, one with a small bowel volvulus and ileal gangrene and one with overwhelming peritonitis from acute phlegmonous cystitis.

The largest group of paraplegic patients are inpatients of the Veterans Administration Hospital system. There were 2,048 such patients as of March 1964.¹² Although the specific incidence of acute abdominal disease in these patients is unknown, it is not believed to differ from that of the nonparaplegic population.¹² The Spinal Cord Injury Service of the Long Beach Veterans Hospital has had 24 patients with acute abdominal emergencies in the last 18 years, and a correct preoperative diagnosis was made in 18 of these patients.¹ Twelve of the patients had appendicitis

and the other 12 had perforation of a viscus—of the colon in six cases, of a duodenal ulcer in three, of a tuberculous appendix in one, of the gallbladder in one and of an inflamed ileum in one.

Depending upon the level of neurologic impairment, the diagnosis of the “acute abdomen” in a paraplegic patient may be extremely difficult or it may be relatively apparent. Cervical or high thoracic-cord lesions preclude pain perception through the usual nerve pathways and also destroy or distort important diagnostic reflexes. However, low thoracic cord or cauda equina lesions do not prevent the appearance of most of the usual signs and symptoms. Table 1 lists the causes and clinical findings in paraplegic patients with acute abdominal conditions reported during the last 18 years. In spite of varying sites of spinal cord lesions in these patients, all had some manifestations of abdominal distress. The most prominent symptom was pain, often of a visceral nature, which was usually sufficient to lead to investigation and treatment of the abdominal lesion. The physical findings were rarely diagnostic and consisted mainly of deep diffuse tenderness without localizing signs.

The site of the neurologic lesion determined the signs and symptoms in most cases. Patients with cervical or upper thoracic cord lesions reported by Hoen and Cooper¹⁰ complained of pain which was “dull, oppressive, and diffuse.” Patients with lesions of the lower thoracic cord described by Greenfield⁸ had the same pain pattern usually associated with acute abdominal disease. One of the patients herein reported upon (Case 1) had a lesion of the upper thoracic cord but did not have localizing signs or symptoms of abdominal distress. The second patient, who had a lesion of the lower thoracic cord, had all the findings expected in any person with acute intra-abdominal disease.

Deep visceral pain is associated with disturbances of an intra-abdominal viscus (distention or spasm) and is thought by some investigators to be transmitted by afferent fibers via sympathetic nerves.²¹ Innervation of intra-abdominal viscera is shown in Table 2. However, this and similar outlines must be regarded as generalizations of the relationship between the level of neurologic involvement and symptoms and signs, since several well documented exceptions have been reported.^{7,8,10,22}

One might question whether the paraplegic patient, because of the disruption of gastrointestinal-

tract innervation, is more prone to develop acute intra-abdominal disease than are normal persons, but there seems to be no definite evidence for this. Keeler and Rusk¹¹ studied the gastrointestinal activity of paraplegic patients with serial x-ray films and found no correlation between gastrointestinal function and the neurologic disease. They found that except for the anal sphincter the bowel functioned independently of the neurologic disease. Robertson and Guttman¹⁹ studied the process of labor in paraplegic women and found that all of them had normal polarized uterine contractions irrespective of the location of the neurologic lesion. However, in paraplegic women with lesions at or above the fifth thoracic vertebrae dilatation of the uterine cervix tended to produce a visceral autonomic stress syndrome, characterized by vasoconstriction, increased blood pressure, lowered pulse and pulse pressure and decreased skin temperature below the site of the lesion. This stress syndrome, termed a “mass reflex,” has been reported in patients with spinal cord lesions who have undergone anesthesia and operative manipulation of the viscera or peritoneum.^{4,5,9,17} The syndrome has been thought to be due to the imbalance of suprasegmental excitatory and inhibitory reflexes which result from certain cord lesions and cause the cord distal to the lesion to be highly excitable.⁴

The management of the paraplegic patient with an acute abdominal condition hinges upon reaching a diagnosis. Signs and symptoms may be atypical.^{8,10} Abdominal pain may be non-existent or dull, diffuse and non-localizing. Nausea and vomiting as well as slight increases in temperature are frequent occurrences in paraplegic patients and are not diagnostic. Temperatures above 103°F suggest a urinary tract infection rather than an acute abdominal emergency. Physical findings are masked. Abdominal tenderness, guarding and rigidity are usually absent. Bowel sounds are rarely significant unless they change in character.

While not confined to cases of acute abdominal disease, the appearance of headaches, changes in blood pressure, sensations of local flushing or heat, and increased reflex irritability are of great value as harbingers of intra-abdominal distress. In this connection it is important to emphasize that the patient with long-standing paraplegia is usually able to recognize when he is ill even though he cannot be specific about his symptoms.

Laboratory studies are often not diagnostic.

TABLE 1.—*Summary of Reported Cases of Acute Abdominal Disease in Paraplegic Patients (1945-1964)*

<i>Author</i>	<i>Location of Neurological Lesion</i>	<i>Symptoms and Signs</i>	<i>Diagnosis</i>
Hoen and Cooper ¹⁰	C-6	Epigastric pain; no abdominal tenderness	Gastric ulcer seen on gastrointestinal series
	C-8	Nausea, vomiting; dull, diffuse abdominal pain; pain at the right costovertebral angle	Renal and ureteral calculi
	T-7	Dull, diffuse abdominal pain	Bowel obstruction
	T-8	Suprapubic pain and tenderness	Bladder perforation
	T-8	Pain in right upper quadrant	Staghorn calculus in right kidney
	C-7	Abdominal distention, hyperperistalsis	Fecal impaction
Greenfield ⁸	T-12	Pain and tenderness, right lower quadrant	Chronic inflammation of appendix
	T-9	Pain and tenderness, right lower quadrant	Chronic inflammation of appendix
	T-1	No abdominal findings; chills and fever (100°F.)	Chronic cholecystitis and cholelithiasis
	T-3	Pain in right upper quadrant, radiation to tip of scapula	Chronic cholecystitis and cholelithiasis
	T-11	Pain in left lower quadrant and fever (101°F.)	Perisigmoid abscess
	T-10	Auto accident; no abdominal pain; hypotensive; tympanitic upper abdomen	Ruptured spleen followed by postoperative subdiaphragmatic abscess
Botterell et al. ²		No clinical summary	Intraperitoneal rupture of perinephric abscess
Watkins ²¹	L-1	Subcostal pain in left upper quadrant, shock, dyspnea	Diaphragmatic herniation of abdominal viscera
Dietrick et al. ⁶		No clinical summary	3 ruptured urinary bladders— 1 ruptured cecum 1 ileal gangrene 1 phlegmon of urinary bladder
Bors ¹		No clinical summary	12 appendicitis— 6 perforated colon 3 perforated duodenal ulcer 1 perforated tuberculous appendix 1 ileitis with perforation 1 perforated gallbladder
Wanebo, Webb and Combs	T-8	Nausea, vomiting, fever (100°F.); no abdominal pain or tenderness	Intraperitoneal perforation with peritonitis from cystostomy tube
	T-12	Nausea and vomiting; pain tender mass left lower quadrant	Acute pelvic inflammatory disease, left salpingitis

Legend: C=Cervical; T=Thoracic; L=Lumbar.

TABLE 2.—*Segmental Sensory Innervation of the Viscera*

<i>Organ</i>	<i>Superficial Areas to Which Pain Is Referred</i>	<i>Vertebral Level for Entrance of Visceral Afferent Axons Into Spinal Cord</i>	<i>Peripheral Visceral Pathway</i>
Liver and gallbladder	Right upper quadrant and right scapula	Thoracic—6*, 7, 8, 9*	Major splanchnic nerves
Stomach	Epigastrium	Thoracic—6*, 7, 8, 9*	Major splanchnic nerves
Small intestine	Umbilicus	Thoracic—9, 10, 11,	Major splanchnic nerves
Colon—			
Ascending	Suprapubic	Thoracic—11*, 12 lumbar—1	Lumbar chain and preaortic plexus
Sigmoid and rectum	Deep pelvis and anus	Sacral—2, 3, 4	Pelvic nerves
Kidney	Loin and groin	Thoracic—11*, 12 lumbar—1	Renal plexus via least splanchnic nerve and upper lumbar rami
Ureter	Loin and groin	Lumbar—1, 2	Renal plexus and upper lumbar rami
Bladder—			
Fundus	Suprapubic		Lower intercostal nerve
Bladder neck	Perineum and penis	Sacral—2, 3, 4	Pelvic nerves
Uterus—			
Fundus	Suprapubic and lower back	Thoracic—11, 12 lumbar—1	Superior hypogastric plexus
Cervix	Perineum	Sacral—2, 3, 4	Pelvic nerves

*Root levels which are in question.

Modified from J. C. White, R. H. Smithwick and F. A. Simeone, *The Autonomic Nervous System*, Macmillan Co., New York, 1952, pp 126 to 139.

Leukocytosis and pyuria frequently occur in the "normal" paraplegic and are of diagnostic significance only if they become more severe. Radiologic studies are the most helpful aid to diagnosis. The presence of dilated, fluid-filled intestinal loops, pneumoperitoneum or calculi may establish the diagnosis. Of utmost importance are close observation of the paraplegic patient and an intimate knowledge of his particular reaction to certain stresses. Deviation from a patient's own norm of well-being may be the only sign of an acute abdominal emergency.

Operation should be performed soon after the diagnosis is reached or after reasonable diagnostic efforts have been made. Care must be exercised to avoid hypovolemia and profound hypotension, which are particularly dangerous in paraplegic patients.²³

Summary

Two cases of acute abdominal emergencies in paraplegic patients are reported. One patient, a 41-year-old man, had pneumoperitoneum and the second patient, an 18-year-old woman, probably had pelvic inflammatory disease.

Diagnosis of abdominal disease in paraplegics with high thoracic or cervical cord lesions is particularly difficult because of absence or distortion of classical signs and symptoms of acute intra-abdominal disease. Close observation of the paraplegic, knowledge of his particular reaction pattern to stress, and judicious laboratory studies are necessary to establish diagnosis. When indicated, operation should be performed early after diagnosis, or after reasonable diagnostic efforts have failed.

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